

Author's response to reviewers on

" Modeling present and future rock wall
permafrost distribution in the Sisimiut mountain
area, West Greenland"

by Marcer et al., The Cryosphere Discuss.,

<https://tc.copernicus.org/preprints/tc-2022-189/>

Contents

Editor's comments 2

Editor's comments

Dear authors,

I read your submitted version of the manuscript. I find that the MS is getting in better shape. However, i still found some aspects in the reading that need to be addressed before finally accepting the manuscript for publication. As suggested before, I strongly recommend you to check the formulations and wording. I also recommend you to avoid the use of acronym before introducing them as the audience of TC is quite broad, and you are dealing with data sets from different disciplines. Please find enclosed a marked file with some suggestions. Please feel free to ignore those that you consider necessary, make your own editions on the marked lines and add further changes.

Best regards,

Adrian Flores Orozco

Dear Editor,

Thank you for your revision and feedback. We have updated the text accordingly. Also, as suggested, we did a number of minor edits to improve readability and wording, as highlighted in the track changes version of the manuscript.

Kindly

Marco Marcer

L1: is not rather the thawing or degradation of the rock wall permafrost? the permafrost itself is not responsible

Sentence changed to:

“Degrading rock wall permafrost was found responsible for the increase of rock fall and landslide activity in several cold mountain regions across the globe.” L1

L4: we aim at at giving a first characterization of rock wall permafrost towards a better understanding....? the paper deals with temperature modeling, that should be the objective/aim (described in this sentence)....

Sentence changed and merged with the next one as following:

“In this study, we aim to make a first step towards a better understanding of rock wall permafrost in Greenland by modelling rock wall temperatures in the mountain area around the town of Sisimiut – 68° N on the West Coast.” L4

L26: and are valid... or are valid only...

Sentence changed to:

“...or are valid only for sedimentary terrain...” L25

L41: both approaches, or modeling approaches...

Sentence changed to:

“Both approaches...” L39

L47: no capital letters

Agreed. All other acronym definitions are modified accordingly

L51: data or results?

Sentence changed to:

“The ERT data allow to interpret the bedrock conditions as frozen/unfrozen...” L50

L53: it does not develop!! provides a model of the change in the electrical resistivity of the subsurface it can also be a 3D model!!!!

Sentence changed to:

“In particular, this methodology provides a model of ground freezing conditions at a given survey date, which can validate numerical simulations” L52

L54: what about monitoring ERT? there are plenty of studies about this!

This sentence does not dismiss the existence of monitoring ERT. We do not use monitoring ERT in this study, therefore we do not develop on such methodology.

L57: To reach our objective...

Agreed

L56: the objective of this study is to understand the distribution of....

The aim of this study is as stated. We do not aim to study permafrost in the whole of Greenland.

L60: material and methods

Removed (there was repetition)

L62: material and methods

Agreed

L63: obtained from two boreholes \ (each one with a maximum depth of 100 m\)

Sentence changed to:

"We calibrate and test our model with temperature data obtained from two boreholes, each drilled to a depth of 100 m in lowland flat bedrock." L60

L64: material and methods

Agreed

L65: strange formulation - you gain this with the boreholes right? you mean to extend the borehole information to different areas and gain information about subsurface heterogeneities?

you mean here you used the ERT results to obtain the distribution of temperatures, right? the approach references belong to the material and methods

Sentence is changed to:

"The model is then used to generate rock wall temperatures at high elevation, which we compare to ERT data acquired on the field." L61

L66: your data set from ERT? or from ? maybe to be more explicit?

Sentence is changed, as above

L67: should not be question 1?

Agreed. Conclusion bullet points are changed accordingly

L68: has this been introduced?

Changed to *"climatic"* L65

L69: is this a conclusion? why this after the research questions?

Removed

L85: this is positive?

No, it's a negative temperature. See text. The automatic latex formatting here is unfortunate but the issue will be resolved when reformatting in the journal style.

L86: has it been introduced?

Yes, at line 60.

L86: has it been intrduced?

That is the name of the instrument. We now introduce it here but let the editor judge if this is in line with the journal style.

L97: intrduce PRT

Agree

L100: if PRT is introduced before, it would be easier for the readers

Agree

L126: introduce acronym

Agree

L131: I would move these lines to start the paragraph and then the sentence with the reference to the petrophysical model

The previous sentence is introductory explaining the generic method, which is in two steps. Here we describe the first step. We would like to keep such structure.

L164: soil temperature modeling? modeling could be anything - also from geophysica data

Changed to "*Rock temperature modeling*" L160

L195: is applicable or has been applied in...

Agreed

L201: maybe you want to avoid acronyms in section tittles?

Agreed

L239: imaging results/ trassects?

Agreed

L256: when was the first analysis? maybe rephrasing or delete this and jpiny wwith previous paragraph to keep it continuos.

This whole section describes three products to describe permafrost distribution and evolution: (i) RST maps, (ii) numerical model and (iii) 2D model. These three products are given one paragraph each as they

are provided through different methodologies rather than consequential. Therefore, we would like to keep them as such, instead of merging them.

L262: evaluate?

Agreed

L266: above you can add the section in parenthesis

Agreed

L375: maybe there is a way to avoid so many "below" and make a better reading?

Yes, sentence changed to:

"When assessing the RMSE throughout the measurement period, we observed values ranging from a maximum of 0.70 °C at the surface to under 0.10 °C at depths less than 10 m.b.g.s., and further decreasing to under 0.01 °C below 80 m.b.g.s. " L372

L412: in particular to what?

"In particular" refers to the previous sentence, where we introduce discrepancy between ERT and numerical model. In this section we enter the details of this discrepancy. We re-arrange the paragraph structure to make this clearer

L419: you mean not correctly resolved by the ERT or maybe just affecting the ERT results?

Affecting the ERT results, specified now in the text. L416

L420: redundant with lines 410 either there or here needs to be deleted

This has been rephrased to better convey main message:

"Despite these local differences, the two methods agree on the general pattern of permafrost distribution, as they both indicate discontinuous permafrost across the mountain and a dominance of the SSRD in discerning between frozen and unfrozen conditions." L418

L444: Hence, or Accordingly, our results reveals that...???

Agreed

L449: ? is this the correct word?

Changed to *"pattern"*

L470: geophysical investigations based on ERT?

Agreed